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TECHNICAL CONFERENCE ON RESISTANCE TO INSECTICIDES

Proposals for an international programme of research

In its seventh report, the WHO Expert Committee on Insecticides[1] noted that resistance to insecticides of the chlorinated hydrocarbon type had been confirmed or suspected in 37 species of insects of actual or potential public health importance. Since that time, resistance has appeared in several other species, and to other insecticides. It is obvious, therefore, that, unless a speedy answer to this problem is found, resistant populations of insects will take the place of the present susceptible ones, and the eradication and vector control programmes will not merely be brought to a standstill, but the ground already gained will be lost.

The Committee recommended that WHO should "assume leadership in the stimulation and co-ordination of an international research programme on the resistance problem". As a first step in this direction, a Technical Conference was held in Geneva from 25 to 31 July 1957. It was attended by directors of the major laboratories able to participate in an international research programme.[2] The conclusions and recommendations summarized below are based on an unpublished report (WHO/Insecticides/66) prepared after the conclusion of the Conference.

Need for international co-ordination

Paradoxically, the more intensively the policy of vector control and eradication is pursued and the wider the area covered, the more serious does the problem of resistance become; it is, in fact, increasing in complexity and magnitude more rapidly than progress is being made in its elucidation. It is important that this should be realized and that, when funds are allocated for vector-control and eradication programmes, a portion should be set aside for financing research, including investigations into the resistance problem. Although WHO has already sponsored a number of research projects on resistance and significant advances have been made, lack of financial support has so far prevented the problem from being studied with the urgency and intensity that the situation demands. Not only has there been too little research, but, owing to lack of co-ordination, it has been concentrated on too few aspects of the problem. Research on an international basis is essential if practical solutions to the many resistance problems are to be hoped for in the foreseeable future, but such a research programme will be successful only if properly co-ordinated. The Conference was of the opinion that WHO is the only international organization in a position to perform this co-ordinating function.

Training and recruitment of personnel

Research on insecticide resistance is at present hampered not only by lack of funds and facilities but also by a shortage of

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[1] *Wld Hlth Org. techn. Rep. Ser.*, 1957, 125

[2] The participants were: Dr A. L. Berti, Jefe de la División de Malariologia, Ministerio de Sanidad y Asistencia Social, Maracay, Venezuela; Dr D. Dresden, Director, Laboratory for Research on Biocides, Central National Council for Applied Scientific Research in the Netherlands, Utrecht, Netherlands; Dr R. A. E. Galley, Director, Colonial Products Laboratory, London, United Kingdom; Dr J. Hamon, Chef du Laboratoire, Service Général d'Hygiène-Mobile et de Prophylaxie, Bobo-Dioulasso, Upper Volta, French West Africa; Dr H. Laven, Max-Planck-Institut für Biologie, Tübingen, Germany; Dr A. W. Lindquist, Head, Insects Affecting Man and Animals Section, Entomology Research Division, US Department of Agriculture, Beltsville, Md., USA; Dr E. Mosna, Director, Parasitology Laboratory, Istituto Superiore di Sanità, Rome, Italy; Mr K. D. Quarterman (Chairman), Chief, Technical Development Laboratory, Communicable Disease Center, US Public Health Service, Savannah, Ga., USA; Dr A. A. Shawarby, Director, Insect Control Section, Ministry of Public Health, Cairo, Egypt; Lieutenant-Colonel Jaswant Singh (Vice-Chairman), Director, Malaria Institute of India, Delhi, India; Mr F. P. W. Winteringham, Officer-in-Charge, Biochemistry Section, Pest Infestation Laboratory, Slough, United Kingdom.

Consultants: Dr C. W. Kearns, Department of Entomology, University of Illinois, Urbana, Ill., USA; and Dr R. L. Metcalf, Department of Entomology, University of California, Riverside, Calif., USA. Secretariat: Dr A. W. A. Brown and Mr J. W. Wright, both of the Division of Environmental Sanitation, WHO.

suitably trained personnel. The Conference believed that one of the most effective ways of attracting scientific workers into this field was to stimulate interest at the undergraduate level by means of lectures delivered by qualified persons in close contact with the problem. It was also suggested that discussion of the insecticide resistance problem should be introduced into the curricula of courses in public health and tropical medicine. It will be necessary to make available facilities for training personnel at all levels, from junior technical assistants to qualified scientists. Such training may take the form of:

(i) a formal post-graduate course at a university;

(ii) a visit for some months to a laboratory at which special techniques have been developed;

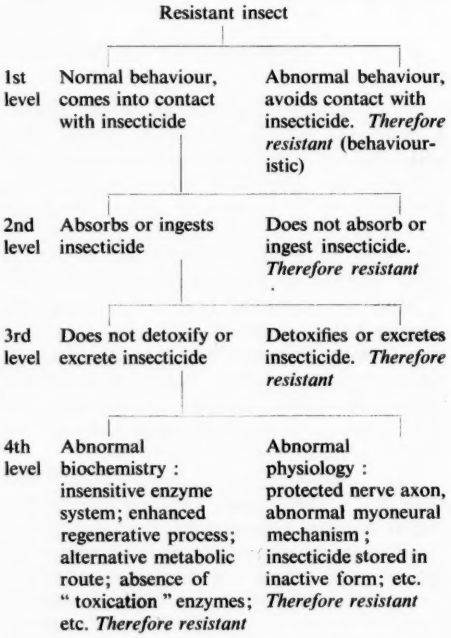
(iii) a relatively elementary course of lectures and practical work for the junior staff.

The Conference also emphasized the value of international meetings of scientists working on resistance problems. They believed that such meetings would help to stimulate research and attract potential workers. At the same time, the first-hand exchange of ideas would provide an effective guard against unnecessary duplication of work and would ensure integration of the results.

Centralized and field research

There is a need both for basic laboratory investigation and for applied field research. Basic research can best be carried out in well-equipped central laboratories with good library facilities and opportunities for contact with other research workers. It has been found that it costs almost twice as much to maintain a research worker at a field laboratory in Africa as at a central laboratory in the United Kingdom. There are some problems, however, that can only be studied satisfactorily in the field. The Conference made the following classification of research on insecticide resistance:

(*a*) *Identification of the resistance mechanism.* This can be further broken down as follows:


Resistant insect
1st level
Normal behaviour, comes into contact with insecticide
Abnormal behaviour, avoids contact with insecticide. Therefore resistant (behaviouristic)
2nd level
Absorbs or ingests insecticide
Does not absorb or ingest insecticide. Therefore resistant
3rd level
Does not detoxify or excrete insecticide
Detoxifies or excretes insecticide. Therefore resistant
4th level
Abnormal biochemistry : insensitive enzyme system; enhanced regenerative process; alternative metabolic route; absence of " toxication " enzymes; etc. Therefore resistant
Abnormal physiology : protected nerve axon, abnormal myoneural mechanism ; insecticide stored in inactive form; etc. Therefore resistant

Work at the first and second levels could be carried out by experienced entomologists either in the field or in fairly simply equipped laboratories. Work at the third and fourth levels involves basic research requiring specialized techniques and would best be carried out in well-equipped, central laboratories.

(*b*) *Study of ecological and genetic factors.* Facilities for insect breeding, accurate dosing, etc., would be adequate for such research, which could be carried out in field laboratories.

(*c*) *Counter-measures.* The pattern of this work will depend largely on which mechanism of resistance is found to be the most important. Much of the work will have to be done in close collaboration with manufacturing and pest control organizations, and the early stage will require research in a well-equipped

insect biochemical laboratory with good chemical facilities. In the later stages, field trials will be essential.

Main lines of research

The Conference found it convenient to discuss the fundamental attack on the problem of resistance under five main headings: genetics, physiology, biochemistry, ecology, and development of new insecticides.

Genetics

A complete understanding of the physiology of resistance can only be gained by studies on pure, homozygous, resistant strains. It is certain that, even in the case of a single species and a single insecticide, several different genetic mechanisms may be responsible for the transmission of resistance. In selecting suitable insect vectors for genetic study, the following criteria should be adopted:

(i) They should be easily and quickly reared at low cost, and require little space.

(ii) They should have a short generation period and high reproductivity.

(iii) They should have a small number of chromosomes.

The Conference suggested the use of ionizing radiations or chemicals to speed up the mutation rate, as has been done with *Culex*. The object is to obtain test strains with a high number of marker genes and so to construct a system of formal genetics for the insect species concerned. By carefully planned cross-breeding experiments, it should then be possible to establish in a relatively short time the genetic factors responsible for resistance in a field population. Another approach would be to compare survival rates in resistant and susceptible strains of known chromosomal types, both under normal conditions and under insecticidal pressure. Such studies could be carried out in cages—for example, on mosquitos and on the housefly—and should yield results of considerable significance as they would simulate field conditions.

Physiology

The Conference recommended that the emphasis should be on comparative studies of the following subjects:

(i) Absorption of the insecticide through the integument. This has been shown to be a factor of minor importance in many strains resistant to DDT but its possible significance in relation to other types of resistance needs further investigation.

(ii) Role of the nerve sheath. This sheath has a very peculiar structure in insects, and evidence has recently been obtained that it plays an important part in regulating the concentrations of ionized compounds in the nervous system. It would appear well worth while to study this question in greater detail, especially the possible influence of insecticides on the permeability of the sheath.

(iii) Relation between fat content and insecticide tolerance, including an assessment of the storage and detoxicating capacities of the fat body.

(iv) Functions and composition of the haemolymph. Very little is known even about such elementary facts as how much haemolymph an insect has and how fast it circulates.

(v) " Natural tolerance " and " vigour tolerance ". The nature of these phenomena and their significance need further elucidation.

The negative correlation between susceptibilities to different groups of insecticides should also repay investigation. If suitable pairs of insecticides could be found, they could be used either in combination to prevent or postpone the development of resistance, or singly in cases where resistance to one of them has already developed. The use of non-toxic chemicals that influence the behaviour of insects—for example, repellents and attractants—offers another possible approach, and the Conference recommended fundamental research on the mode of action of these compounds. With a view to finding " hormone-based " insecticides, the study of

insect hormones should be more actively pursued. Insecticides of this type would have the important advantage of being non-toxic to man and animals. On the other hand, resistance to them might still develop.

Biochemistry

The first aim of biochemical research must be to determine the site of action of the insecticide, as this will focus attention on the vital systems which might be inhibited. In the absence of evidence for a biochemical action, a biophysical action might be considered. It has recently been suggested that the molecular configuration of DDT, together with its thermodynamic properties, enables it to disrupt the nerve membrane lattice. An attempt should be made to confirm or disprove this hypothesis. If it is found to be correct, a similar explanation would presumably apply to other chlorinated hydrocarbons.

A comparative study of the biochemistry of normal and resistant strains should throw considerable light on the mechanisms of resistance. The depletion of proline in the blood of insects exposed to DDT is an example of the kind of difference that may be found. The catabolic fate of the insecticides in susceptible and resistant strains must be studied and a search made for toxic metabolites in the blood or organs. Certain organophosphorus insecticides are not toxic in themselves but are oxidized to toxic products in the body of the insect. It is possible that in resistant strains this so-called " toxication " process fails to occur.

Once evidence has been obtained that certain biochemical mechanisms appear to be responsible for resistance, quantitative studies will have to be made on the mode of inheritance of these systems. Biochemical and genetic studies are thus complementary.

Ecology

Changes in behaviour of insect populations following extensive spraying operations, enabling the insects to escape the action of the insecticide, have frequently been reported. To enable the validity of these reports to be checked, comparative studies of the ecology of normal and resistant populations are needed. Particular attention should be given to biting and resting habits (whether indoor or outdoor), breeding areas, and changes in life cycles or biotic potentials, such as increased fecundity or viability. The Conference recommended that laboratory tests should be worked out to enable quantitative measurements to be made of what might be considered the normal levels of behaviour of field populations. Such tests would be particularly useful in areas where control measures have not yet been applied but are planned for the near future.

Development of new insecticides

The ideal insecticide for vector control programmes should combine high toxicity to insects and prolonged residual action with low mammalian toxicity, and should be inexpensive. The organophosphorus insecticides have attracted much attention because they are effective against insects resistant to compounds of the chlorinated hydrocarbon type, but organophosphorus compounds combining long-lasting residual action with low mammalian toxicity are still lacking. Moreover, resistance to certain of these insecticides has already appeared in *Musca*, *Aëdes* and *Culex* in isolated areas. Laboratory evidence suggests that flies resistant to malathion are susceptible to parathion and diazinon, and that chlorthion-resistant flies are susceptible to closely related compounds. It is essential that field evidence on the cross-tolerance of these compounds should be obtained at the earliest opportunity. If the mechanisms of resistance can be demonstrated by biochemical investigations, it may be possible to overcome them by suitable modifications in the structure of the insecticides, or by combining them with synergists—for instance, with compounds capable of blocking detoxication enzymes.

The carbamate or urethane insecticides, which act by blocking cholinesterase, do not appear to exhibit cross-tolerance with the organophosphorus insecticides and were recommended for further study. Pyrolan and isolan have already been of limited value in vector control programmes.

Species resistant to the chlorinated hydrocarbons can also be attacked successfully with

the pyrethrins and the synthetic pyrethroids, which are the most effective space sprays at present in use. Another field deserving of further study is the use of synthetic esters of chrysanthemum monocarboxylic acid as larvicides.

One of the most promising lines of approach seems to be the search for enzyme inhibitors. Iodoacetic acid is known to inhibit triosephosphate dehydrogenase and it has been shown to be toxic to houseflies resistant to chlorinated hydrocarbons. Studies of esters and related compounds are under way. Fluoroacetic acid and its amide are inhibitors of cis-aconitase and are highly toxic to insects. Though they are not suitable for practical application, it may be that more useful inhibitors can be found. It has also been reported that *l*-glutamic acid oxidase is inhibited by low concentrations of rotenone, and it would be interesting to look for other inhibitors of this enzyme. Finally, there is the possibility of producing metabolic exhaustion by inhibiting the formation of high-energy phosphate bonds. Two insecticides which act in this way—4,6-dinitro-*o*-cresol and pentachlorophenol—are already in use, but further investigation of this system is needed.

It is hoped that biochemical studies will disclose the sites and modes of action of other existing or potential insecticides, including such substances as ryanodine, the veratrine alkaloids, and the N-isobutylamides, and that from this knowledge it will be possible to proceed to the synthesis of compounds with more useful properties.

Conclusions and recommendations

In summing up its deliberations, the Conference again stressed the dynamic nature of the resistance problem, which is increasing in severity from day to day. Empirical methods of attack have largely failed or given only temporary success. On the other hand, fundamental research and development are slow and are concentrated at relatively few centres in different parts of the world, usually widely separated from the areas where the resistant vectors are found. The Conference therefore recommended that prompt action should be taken by WHO to co-ordinate these activities along the lines suggested in the report. The directors of the laboratories attending the Conference unanimously agreed to participate in an international programme of research and proposed that a copy of the report should be sent to laboratory directors not present, together with a letter inviting their participation.

It was felt that, in addition to enlisting the support of international, governmental and private agencies, and assisting laboratories in planning research projects, WHO could perform a valuable service by facilitating the dissemination of information. Rapid exchange of information would greatly stimulate and accelerate research. The Conference therefore urged that abstracts or summaries of research papers should be sent to WHO at the same time as they were submitted for publication, and that interesting findings not intended for publication should also be communicated to WHO for possible inclusion in the information circular published every two months. Emphasis was also placed on the value of a free interchange of scientific personnel between the laboratories taking part in the programme, and an increase in the number of fellowships for international travel was advocated. Progress would be helped by the early development and adoption of international standard tests for measuring physiological resistance and for the quantitative assessment of behavioural response to insecticides. An important recommendation concerned the facilitation of the supply and exchange of research material, particularly insect strains of special research interest, rare biological chemicals, and isotopically labelled insecticides and related compounds. It was felt that the good offices of WHO could be of great value in making such material available and accelerating its travel across international borders.

In an appendix to the report of the Conference, a list of 57 suggested research projects on insecticide resistance is given. On 17 of these projects, investigations have already commenced.

EUROPEAN SEMINAR ON VETERINARY PUBLIC HEALTH

As part of a continuing effort to promote increased recognition of veterinary public health problems and to stimulate the development of services to deal with them, the WHO Regional Office for Europe in late 1957 sponsored a third seminar on this subject. The previous meetings, held in Vienna in November 1952 and in Copenhagen in February 1954, were concerned with five specific zoonoses [1] and with meat hygiene,[2] respectively. At this third seminar, which took place in Warsaw from 25 November to 4 December 1957, physicians and veterinarians from 23 European countries met to consider: (1) the scope and organization of services relative to veterinary public health and food hygiene, and (2) six zoonoses of importance to most of the countries represented. Sessions on the first topic were attended by 38 participants from Austria, Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Morocco, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Turkey, the USSR, and Yugoslavia; an additional 30 Polish physicians and veterinarians particularly concerned with the zoonoses were present at the discussions of these diseases. The Food and Agriculture Organization of the United Nations was also represented at the seminar.

The purposes of the seminar were to call attention to recent technical advances in veterinary public health and to show ways and means, appropriate to conditions in the different countries of the European Region, of securing the closest possible collaboration between veterinary and public health personnel in coping with problems which cannot be handled adequately by either veterinary or public health services alone. The programme included films on relevant subjects, laboratory demonstrations, and visits by the participants, as guests of the Polish Government, to the Veterinary Institute in Pulawy, which is concerned principally with research and the production and testing of biological products, and to the State Institute of Rural Occupational Medicine and Hygiene in Lublin.

[1] The papers presented at this seminar have been published in *Advances in the control of zoonoses (World Health Organization: Monograph Series*, No. 19).

[2] The papers presented at this seminar have been published in *Meat hygiene (World Health Organization: Monograph Series*, No. 33).

SCOPE AND ORGANIZATION OF VETERINARY PUBLIC HEALTH SERVICES

Interrelationship of human and animal health

Dr J. H. Steele, Chief of Veterinary Public Health, United States Public Health Service, Communicable Disease Center, Atlanta, Ga., introduced the subject of the interrelationship of human and animal health, pointing out the importance not only of the zoonoses and food hygiene, in which the connecting links between man and animals are apparent, but also of problems which are not so readily recognized, such as radio-activity levels in animal products. He spoke also of the contributions comparative medicine can make to the study of the common degenerative diseases which are among the most serious public health problems in many countries today—cardiovascular disorders and cancer, in particular. In the USA, for example, investigations of the prevalence of these two types of disease in animals and of the ecological conditions under which they occur are being inaugurated and, together with related basic research in physiology and pathology, are expected to yield, over a number of years, results which may do much to clarify the etiology of cancer and cardiovascular disorders in man.

The known zoonoses will doubtless continue to be of public health concern; but, as was noted in the course of the discussions, many other zoonoses, either actually emerging as new disease entities or merely being uncovered by improved techniques, may

demand increasing attention in the future. For instance, apparently specific antibodies for human poliomyelitis have been found in animal sera (cattle and swine); and evidence is being accumulated that cytopathogenic viruses analogous to the ECHO viruses [3] in human beings can be isolated from the gastro-intestinal tract of animals. Still another possible relationship between animal and human disease is being investigated by WHO in a co-ordinated study in 25 countries of the role of swine and other domestic animals in the epidemiology of human influenza. It is known that swine were infected with the human strain of influenza virus responsible for the devastating 1918 pandemic, and swine influenza caused by virus strains related to human influenza strains has been well defined since 1918, but it is not known whether swine first became infected with the human influenza viruses at the time of the 1918 pandemic or whether the pandemic actually originated from the infection in swine. Similarly, consideration is being given to the possibility that the 1957 pandemic of influenza might have originated from swine or another animal.

Ecology of the zoonoses

The subject of the ecology of the zoonoses was introduced by a paper by Dr I. G. Galuso, Director of the Institute of Zoology, Academy of Sciences of the USSR, Alma-Ata, Kazakh SSR. Dr Galuso described in detail the theory, and its practical applications, of natural foci of diseases. According to this theory, which is expounded by Professor Y. N. Pavlovsky and his school in the Soviet Union, the zoonoses may be distinguished from other infectious diseases of man by their special epidemiological and ecological characteristics. The sources of human infection are animal, and the infective principle may pass between animals in nature independently of man. This is particularly true with respect to virgin territories previously uninhabited by man: the diseases are usually associated with definite geographical landscapes and have a seasonal occurrence; and a well-balanced, natural ecology has been established in these areas over the years. But, when such areas become inhabited by man, he intrudes upon the natural cycle of infection, and, as a consequence, becomes infected himself. Tick and insect transmission often play a prominent part in this group of zoonoses. A number of important diseases are considered to fall within the framework of this concept: tick-borne encephalitis, Japanese B encephalitis, plague, tularaemia, tick-borne rickettsioses, cutaneous leishmaniasis, many parasitic infections, and, to some extent, diseases such as psittacosis (ornithosis) and brucellosis.

Pavlovsky's theory has given rise to very fruitful field studies by large groups of collaborating scientists in the Soviet Union, Poland, and Czechoslovakia. Other countries have recognized the epidemiological logic supporting this theory and have undertaken appropriate investigations, but large-scale applications have been made chiefly by Soviet scientists.

Food hygiene

Discussions on food hygiene were led by Dr W. C. Cockburn, Director of the Epidemiological Research Laboratory, Central Public Health Laboratory, London, England, and Dr A. Jepsen, Professor of Food Hygiene and Microbiology, Royal Veterinary College of Denmark, in Copenhagen. Emphasis was given to meat and milk hygiene and to processed food.

Techniques used in the United Kingdom since 1949 for investigating outbreaks of food-borne diseases have proved very efficient and have enabled British authorities to obtain a much more accurate idea of the significance of these diseases than was formerly possible. In 1956, some 18 000 persons were reported to have been affected by food poisoning, but it was stressed that the cases reported undoubtedly gave only a partial picture of the situation. Over 70% of the outbreaks investigated from 1949 to 1956 were due to meat, with processed and made-up meat accounting for more than 85% of the meat-borne infections.

[3] Enteric cytopathogenic human orphan viruses

Salmonella infection is the greatest single cause of food-borne diseases, with meat and eggs (usually dried or frozen) being the worst offenders. In 1953 in Sweden, a meat-borne *Salmonella* epidemic affected more than 9000 people; and 2000 cases were reported the following year, no doubt partially as a carry-over from the widely seeded infection of the previous year.

The epidemiological and laboratory services required for the investigation of outbreaks of food poisoning were discussed in detail. It was stressed that only by close collaboration among public health, veterinary, and sanitary services can an effective food hygiene control programme be established. The importance of better hygiene among food handlers was pointed out; and, in this connexion, the recommendations of the WHO/FAO Expert Committees on Meat and Milk Hygiene [4] were considered very valuable.

Dr E. Holager, Chief Veterinary Public Health Officer, Haman, Norway, who served as veterinary public health consultant to the WHO Regional Office for Europe, then spoke of the problem of by-products of abattoirs and their significance in the transmission of diseases to man and animals. The use of destructor plants for economic salvage of carcasses was described, and their possible application in countries not yet employing them was suggested.

Veterinary public health practice

The organization and administration of national, provincial, municipal, and rural veterinary public health services were discussed by Dr J. Parnas, Director of the State Institute of Rural Occupational Medicine and Hygiene and Professor at the Academy of Medicine in Lublin, Poland. Dr Parnas emphasized the necessity for establishing close links between health and agricultural services. At the national, provincial, and municipal levels, it is of basic importance to have a veterinary health unit, within the public health services, to co-ordinate activities relative to the control of the zoonoses and food hygiene and to stimulate efforts to improve and expand such activities. In rural areas the practising veterinarian, or his assistant, can give valuable support in reporting and controlling the zoonoses and in improving food hygiene. Dr Parnas described some of the work of his Institute where studies in rural areas of brucellosis, leptospirosis and bovine tuberculosis were undertaken by teams of physicians, veterinarians, zoologists and other professional workers.

In the discussion which followed Dr Parnas's talk, it was noted that some European countries have established veterinary public health units such as those described, while others are including such units within the agricultural services. It was generally agreed that the organization of a veterinary public health unit within the administrative framework of either the health or the agricultural services would give considerable impetus and effectiveness to efforts to deal with the many problems and untapped resources pertinent to human and animal health relationships. Dr D. Studič, Veterinarian of the Research Institute of the Republic of Serbia and Adviser on Veterinary Public Health to the Central Public Health Institute of Yugoslavia, in Belgrade, covered the subject of collaboration among workers in the medical, veterinary, sanitary, and allied disciplines.

Reporting of the zoonoses

Dr M. Kaplan, Chief of the Veterinary Public Health Section at WHO Headquarters, and Dr Steele introduced the discussion of mechanisms for more efficient reporting of the zoonoses. An adequate morbidity reporting system is essential for the successful control of all communicable diseases; rabies provides a good example of a disease with regard to which control and possible eradication within a country or a specific area are dependent on satisfactory reporting of cases. In many countries the reporting of the zoonoses constitutes a weak link in the morbidity statistics system. Full information on these diseases can be obtained only through

[4] *Wld Hlth Org. techn. Rep. Ser.*, 1955, **99** (meat hygiene) 1957, **124** (milk hygiene)

co-operation between private veterinary practitioners and the official veterinary and public health services.

It has been found that simplified reporting forms, usually cards bearing a list of the major zoonoses and other purely veterinary diseases of the area in question, are an aid in promoting better reporting. Such forms are sent to private practitioners and provincial veterinary offices in both the public health and agricultural services, and the compiled returns are distributed periodically to all interested persons.

The initiative for improving the reporting system can be taken by the public health veterinarian attached to the health services of a region, who, in co-operation with his counterpart in the agricultural services, can stimulate the inauguration of a periodic reporting service appropriate to the problems and needs of the particular area. The information derived from smaller areas should be relayed to the provincial and national veterinary public health services.

It was pointed out in the discussions that, in areas where there is a lack of veterinarians, it is often possible to use the services of an assistant trained in specific veterinary techniques for reporting suspected outbreaks of zoonoses to the health or agricultural services. Fortunately, most European countries have available trained veterinarians to follow up at short notice any suspected outbreaks of serious epizootic diseases.

The reporting of food-poisoning outbreaks usually requires a separate, closely-knit organization, such as the public health laboratory and epidemiological service set up for this purpose in the United Kingdom. In food-poisoning outbreaks, very rapid, on-the-spot investigations are necessary in order to obtain accurate histories and specimens of the suspected food, which must be submitted to laboratories for examination.

Training of personnel

The topic of training personnel to meet the responsibilities of veterinary public health was discussed by Professor R. Vuillaume, Chief of Veterinary Services of the Ministry of Agriculture, Paris, France. Dr Vuillaume drew attention to the necessity of introducing the undergraduate veterinary and medical student to the problems common to both disciplines. Since 1955 veterinary public health has been included as an "elective" subject in the senior year of the undergraduate veterinary curriculum in France.

Even more important is the need to provide for the training of graduate veterinarians in public health, as is done in North and South America. Facilities and opportunities for such training are practically non-existent in Europe at the present time, and the WHO Regional Office for Europe has recognized the need for them and is taking steps to remedy the situation. It was noted that the High Institute of Public Health in Alexandria, Egypt, in 1957 inaugurated special lecture and laboratory courses in veterinary public health for post-graduate physicians and veterinarians which will become a regular part of the curriculum. A special course in veterinary public health is scheduled for 1959 at the School of Public Health in Zagreb.

ADVANCES IN THE CONTROL OF SPECIFIC ZOONOSES

Tick-borne encephalitis

Dr D. Blaskovič, Director of the Virology Institute, Czechoslovak Academy of Sciences, Bratislava, gave a summary of the present knowledge of tick-borne encephalitis, which is a cause of increasing concern in some European countries, including Austria, Czechoslovakia, Poland, the Soviet Union, and Yugoslavia. Individual outbreaks involving as many as 600 people in a single village in Czechoslovakia several years ago were described. While the tick has been shown to be a transmitter of the virus causing this disease, which is related to Russian spring-summer encephalitis and louping ill, some outbreaks have been definitely traced to the consumption of raw goat's milk, the virus apparently being excreted in the milk of infected goats. Extensive studies of the biological cycle of the virus, with special emphasis on its persistence in the tick vector, are now under way

in Czechoslovakia, Poland and the Soviet Union.

Rabies

Dr Kaplan introduced the subject of rabies, concentrating on the late developments considered in the recently issued report of the WHO Expert Committee on Rabies.[5] Among the topics given particular attention were the incorporation of anti-rabies serum in the human prophylaxis of rabies, the local treatment of wounds, vaccine schedules for pre- and post-exposure immunization of human beings, recent findings on vaccine for use in different species of animals, the organization of a rabies control programme, and legislation suitable for European countries with respect to the international transfer of animals.

In the discussions it was brought out that rabies is a problem for most European countries where the disease is either enzootic or threatens to cross national boundaries. Special precautions are required in countries such as Belgium, Denmark, Finland, France, the Netherlands, and Switzerland, all of which have common borders with rabies-affected countries. Denmark, for example, has instituted the practice of vaccinating all dogs within a zone 25 km in depth along the border of Germany and of clearing this zone of wildlife, in so far as this is possible. Sporadic cases of rabies have recently appeared in France and have led to more severe restrictions with regard to animals entering that country. The United Kingdom and the Scandinavian countries have remained free of rabies; this is attributed to their severe quarantine restrictions with respect to the importation of animals, particularly dogs and cats. Intensive campaigns for the vaccination of dogs were reported from Poland, Portugal, Spain, the Soviet Union, Yugoslavia, and other countries.

Wildlife rabies, particularly in foxes, was shown to be a difficult problem; and the seminar afforded an opportunity for an exchange of experience from different countries on this subject. A disturbing development has been the isolation of the rabies virus from ordinary insectivorous bats in Yugoslavia and, possibly, in one instance in Hamburg, Germany.

Throughout the discussions, the necessity for close collaboration between veterinary and public health services was stressed, and the advantages of co-ordinating a rabies control programme under the supervision of a veterinary public health unit were enumerated.

Leptospirosis

The present position of leptospirosis was outlined by Dr B. Babudieri, Professor of Microbiology at the Istituto Superiore di Sanità, Rome, Italy. This disease is becoming increasingly serious because of the large domestic-animal reservoirs of infection, apart from its transmission by rodent carriers. Yearly outbreaks in many European countries—Italy, Poland, Spain, and the Soviet Union, among others—have been attributed to special ecological conditions associated with rice fields and marshlands. The use of vaccine prophylaxis in field workers was described at length.

During the discussion mention was made of the difficulties in laboratory procedures for the diagnosis and typing of the organism, a problem being carefully studied by the WHO/FAO Leptospirosis Reference Laboratories. It is hoped that eventual standardization of laboratory procedures will give greater significance to epidemiological surveys as well as to individual diagnoses.

Brucellosis

Dr Kaplan introduced the topic of brucellosis by reporting on recent advances considered by the Joint FAO/WHO Expert Committee on Brucellosis which met in Lima, Peru, in October 1957. The subjects covered included modifications in human therapy, vaccine prophylaxis in human beings, legislation and control procedures with regard to animals, and, particularly, the problems involved in the control of sheep and goat brucellosis, which has recently

[5] *Wld Hlth Org. techn. Rep. Ser.*, 1957, **121**

spread through Central Europe. The extensive work of the Soviet Union in vaccine prophylaxis in humans and animals was noted with great interest; and, in this connexion, the activities during the past five years of several of the FAO/WHO Brucellosis Centres were also described. The difficulties of controlling swine brucellosis, which has assumed rather extensive proportions in many European countries, were discussed.

Again, emphasis was placed on the necessity for close collaboration between public health and veterinary services in inaugurating and stimulating campaigns to control and eventually to eradicate this disease, a long and often costly business. The striking successes in eradication of brucellosis in the Scandinavian countries, and the excellent progress being made in other countries, such as the Netherlands and the United Kingdom, were brought to the attention of the seminar participants.

Toxoplasmosis

Dr J. C. Siim, Chief of the Toxoplasma Laboratory, Statens Seruminstitut, Copenhagen, Denmark, described toxoplasmosis as one of the most widespread infections in animal life, although its exact epidemiology is still not too well defined. Extensive surveys in humans carried out in some of the countries of Europe have revealed the significance of this disease, which, whether a congenital infection or acquired post-natally, can affect the central nervous system, the viscera, and the eye. Detailed attention was given to the difficulties in laboratory diagnosis of toxoplasmosis; there is some indication, however, that newly developed techniques may eliminate some of the problems involved.

Discussion brought out the concern which many clinicians, particularly ophthalmologists, feel about this disease. The need for increased epidemiological studies and for work on diagnostic procedures was stressed.

Dermatophytosis

The dermatophytoses do not represent an acute danger to public health, but they are a great nuisance because of the chronic nature of the disease when it affects schoolchildren as well as adults. Dogs, cats, and cattle are the principal reservoirs of the animal-human dermatophytes.

Dr C. J. P. La Touche, Lecturer in Medical Mycology in the Bacteriology Department of the University of Leeds, and consultant to the Dermatology Department at the Leeds General Infirmary, described the excellent epidemiological organization in Leeds, England—an organization which has been in existence for several years. All suspected and confirmed cases of dermatophytosis are investigated, and a search for the animal reservoir is made. The use of diagnostic techniques, including Wood's lamp, was demonstrated; and these procedures were recommended as valuable tools for both veterinary and medical laboratories.

Quarantine and vaccination requirements

A recent supplement to the WHO *Weekly Epidemiological Record* (No. 6, 1958, Suppl. 1) contains details on quarantine measures and vaccination certificate requirements relating to cholera, yellow fever and smallpox, as on 7 February 1958. Information is given for more than 170 States and territories throughout the world.

FOOD AND DRUG PROBLEMS IN THE AMERICAS: A CO-OPERATIVE APPROACH*

The need for the free flow of safe foodstuffs to the consumer is obvious. It is perhaps less obvious, though equally essential, that drugs necessary for the health of the public should also be available through the channels of commerce, subject to adequate, but not superfluous, safeguards. While drug control regulations are in force in most countries, such difficulties as delays in processing applications for registration, obsolete technical requirements, and restrictive packaging requirements—to mention only three—are all too frequent. Moreover, official specifications vary from country to country.

Difficulties of this type have been a source of concern to governments, health authorities, the medical profession, and the pharmacological and chemical professions for many years. Many of them arise from a lack of adequate technical information on the part of the licensing authorities in what has now become a most complex field—one, moreover, in which there is an acute shortage of trained technicians.

Although legislation on the safety, purity and potency of all food and drug products is the responsibility of each country, the problem is international in scope. Certain chemical preparations, as well as a large number of foodstuffs, have long been important items in international commerce, but in recent years the market has been inundated with new pharmaceutical products, particularly antibiotics, most of which are produced in only a few countries. Their introduction into other countries may be hampered if importers and licensing authorities are unable to take safe and rapid decisions for lack of adequate information.

Purpose of legislation

The main purpose of food and drug laws is to prevent the sale and distribution of unsafe, inadequate, adulterated or misleadingly branded products. In the United States, for example, the Federal Food, Drug, and Cosmetic Act, the Federal Trade Commission Act, and legislation in each State combine to ensure the sanitary protection of foods and patent drugs, the use of true weights and measures, the supervision of drug stores, and adequate controls for meat and other farm products, and for narcotic, poisonous and other dangerous drugs. Existing legislation in other countries has the same aims, but is often less comprehensive. For this reason, some countries—especially certain of the smaller ones—have not yet been able to establish effective food and drug control services. Ideally, all such legislation should safeguard public health, without imposing unnecessary restrictions on the movement and sale of goods.

Activities of the United Nations, WHO and FAO

The United Nations and its specialized agencies have undertaken a number of important activities relating directly or indirectly to the control of food and drugs. A considerable degree of uniformity in legislation pertaining to narcotic drugs has already been achieved as a result of international conventions during the past half-century, and work in this field is being carried on by a United Nations Commission on Narcotic Drugs and a WHO Expert Committee on Addiction-Producing Drugs. WHO has published the first International Pharmacopoeia, prepared with the assistance of an expert committee, and has convened Expert Committees on Biological Standardization

* Condensed from an article in *Quarterly of the Pan American Sanitary Bureau*, 1958, 2, No. 1

and on Antibiotics. The Organization periodically issues lists of recommended international non-proprietary names for pharmaceutical preparations with a view to obtaining their general recognition.

The Food and Agriculture Organization of the United Nations (FAO) disseminates data on food and nutrition, and joint FAO/WHO committees have made recommendations on nutrition, food additives, and standards and techniques in respect of milk and meat hygiene.

Needless to say, the work of these organizations has contributed towards a better understanding of food and drug problems throughout the world. To derive full benefit from this work, however, a country must have efficient food and drug services backed by appropriate legislation. This matter was among those discussed by a WHO Study Group on Specifications for Pharmaceutical Preparations, which met in December 1956 to consider methods used for the examination of pharmaceutical products in various countries. Its report [1] includes suggestions for the organization of a national drug control service, and outlines the principles to be followed in introducing new pharmaceutical products. In discussing international programmes, the Group referred in particular to the studies which had been undertaken in this connexion in the Americas.

Activities in the Americas

In September 1957, a proposal for the gradual development of international co-operation on food and drug problems in the Americas was approved by the Directing Council of the Pan American Sanitary Organization (PASO), which serves as the WHO Regional Committee for the Americas. The Council also approved, as a point of departure, a general plan of procedure submitted by the Director of the Pan American Sanitary Bureau (PASB), the Organization's executive body.

The subject of the Council's decision was one that had been under consideration in the Americas for many years. Thus, as long ago as 1923, the Fifth International Conference of American States recommended the early adoption of internationally uniform food and drug legislation, in order ultimately to obviate the necessity of analyses by importing countries. The following year, the Seventh Pan American Sanitary Conference outlined basic principles for the proposed legislation, but, as the necessary funds were lacking, no action was taken.

The matter was discussed again by the International Conference of American States in 1933, and by the Pan American Sanitary Conference in 1934 and 1938. Again no action was taken owing to lack of funds.

An exhaustive discussion on international food and drug regulations took place at the XIIth Pan American Sanitary Conference in 1947. This time, the Conference directed PASB to organize an international working unit and a group of experts composed of representatives of each American country. These bodies were assigned the overwhelming task of studying problems relating to the international distribution, not only of food and drugs, but of cosmetics as well, and of preparing a bromatological code and a Pan American Pharmacopoeia. The Bureau's mandate in this connexion lapsed in 1950, however, when the XIIIth Pan American Sanitary Conference relieved it of responsibility for implementing any resolution that had not been supported by an appropriation of funds.

Interest in the subject nevertheless continued, and the creation of an inter-American agency for the control of drugs was proposed at the Second Pan American Congress of Pharmacy and Biochemistry in 1951. In 1955, a committee to study a Latin American food code was formed by the Latin American Chemical Congress, and, in the same year, the Fourth General Assembly of the Pan American Medical Confederation passed a resolution designed to achieve the maximum possible uniformity of legislation on the inscription, registration and distribution of pharmaceutical preparations in the countries of the Americas.

In June 1956, the PASO Executive Committee approved the proposal of the Pan American Medical Confederation in principle,

[1] *Wld Hlth Org. techn. Rep. Ser.*, 1957, 138

and requested the Director of PASB to draw up a plan of procedure in consultation with the Pan American Union, WHO and the International Union for the Protection of Industrial Property (which protects patents and proprietary names). As already mentioned, this plan of procedure was approved by the Directing Council of PASO in September 1957.

Plan of procedure

In view of the differing stages of development of food and drug control in the various countries and the number of interests involved in a problem which has medical, public health, economic and political aspects, the Director of PASB was of the opinion that a careful and thorough survey of food and drug problems in each country was a prerequisite to international action. The Council formally entrusted PASB with the responsibility for this survey, which will be carried out during 1958.

The Director suggested the following activities for eventual consideration:

(*a*) the establishment of a clearing-house, financed by participating countries, to provide to governments, and through them to industry and interested groups, information on food and drug laws, regulations, and practices in American countries (see below);

(*b*) the review and analysis of current legal requirements on the export, import, manufacture, and supply of foods, drugs, cosmetics, and therapeutic devices; and the development of legislative standards on the registration of drugs and on other activities related to food and drugs, for recommendation to governments;

(*c*) the development, within the framework of such standards as may be formulated by WHO, of recommended standards of safety, purity, potency, hygiene, quality, packaging, etc. of food and drugs;

(*d*) the provision of expert advice and assistance on the development of national food and drug activities;

(*e*) training programmes for national scientific, technical and administrative personnel, including a fellowship programme to be undertaken in co-operation with universities and food and drug agencies;

(*f*) laboratory services for the development of standard laboratory methods, testing (or reviewing national testing procedures) and reference.

International information centre

Referring to proposals for an international conference to consider uniform legislation on food and drugs, the Director considered that such a conference would not be of any practical value until a solution had been found to the basic problem of making sound technical and scientific data available to all countries. Authorities in several countries have already shown interest in the establishment of an inter-American food and drug information centre on the lines of the Institute of Nutrition of Central America and Panama (INCAP), which is financed by quota contributions from member countries and assisted administratively by PASB.

In the decade since its foundation, INCAP has become one of the leading centres of its kind, offering services which none of its member countries could afford individually. Institutions such as INCAP and the Pan American Zoonoses Center at Azul, Argentina,[2] which have the backing of a number of countries and one or more international organizations, are a most efficient means of stimulating co-ordinated action in certain fields. The development of a similar institution to deal with food and drug problems in the Americas must, however, await the results of the survey now being undertaken by PASB.

* * *

Whatever is decided in the future, the control of food and drugs will still remain the direct responsibility of the individual governments. Nevertheless, by promoting co-operation between governments in this matter, PASB can play a vital part in making safe foods and drugs more easily available in all the countries of the Region.

[2] See *Chron. Wld Hlth Org.*, 11, 348.

WORLD HEALTH DAY 1958 : TEN YEARS OF HEALTH PROGRESS

World Health Day 1958 (7 April) marked the tenth anniversary of the day when the Constitution of the World Health Organization came into force. Its theme was " Ten Years of Health Progress ". The occasion was therefore used by health authorities throughout the world to draw attention to the progress towards better health made during the past decade, as a result of both national and international efforts, in each region and each country.

The following passages are taken from various special messages and articles issued in connexion with World Health Day:

" There have been great scientific advances—new drugs, new vaccines, new or improved insecticides and better methods of combating and preventing disease.

" This new knowledge is being rapidly applied where it is needed. In the last ten years the flow and exchange of scientific information and practical experience have perhaps been greater than ever before. More scientists and health workers than ever before have gone from country to country to learn, to teach and to demonstrate.

" Even more important is that an increasing number of people everywhere realize that health is a way of living and thinking, and not merely the absence of disease and infirmity. Governments have come to accept their responsibility for the health of their peoples, and their obligation to provide, besides the classical hospitals and institutions, improved environmental conditions, health care for mothers and children, and safeguards for food and nutrition.

" . . . Rapid pooling of information and experience makes it simpler to contend with diseases like influenza and poliomyelitis, to meet the threat to mental health that grows from modern conditions of life, to adapt medical education to changing needs, and to study emerging problems like that of the hereditary effects of radiations.

" Those countries that are struggling to conquer age-old diseases and to build up modern public health services benefit further from the practical help given, in the true ' co-operative ' spirit, by all countries through the World Health Organization. Ten years of trial and error, of success and failure, have shown the usefulness and also the limitations of this international assistance. As their confidence grew in the possibilities thus offered for hastening progress, health administrations have also learned what efforts they themselves must make in order to obtain the best results from outside help."

*** Dr. M. G. CANDAU, Director-General, WHO

" The Constitution of the World Health Organization describes health as a fundamental right of every human being. As we all know only too well, this right is far from being enjoyed by everybody, whether we are thinking of our immediate surroundings or of people in distant lands. Yet—however precarious the balance between health and disease may be—this ' right ' averred by the 88 signatory governments of the WHO Constitution is more than a desire, more than a claim. And if we look back over the years I think we can agree that the idea of health as a right for every man has made progress.

" . . . I would wish to stress here the impetus given in Europe to the *prevention* of ill health, a development in which the medical practitioners, other health workers and indeed the public at large are joining forces. I am thinking not only of classical disease prevention through vaccination and vector-control—domains in which steady advance has been achieved in Europe—but also of the awakening interest in preventing mental disorders and chronic diseases. Accidents generally and pollution of air and water are further health problems of great urgency in this Region for the solution of which the preventive approach has been gathering momentum and is now beginning to show results."

*** Dr PAUL J. J. VAN DE CALSEYDE, WHO Regional Director for Europe

" In the Americas it is noteworthy that since 1947 the Pan American Sanitary Organization has operated on a continent-wide basis and since 1949 the programme of the World Health Organization in the Western Hemisphere and that of the Pan American Sanitary Organization, separately financed by the nations of the Americas, have been united as a single continental programme.

" The most important single development in public health in the Americas during the past decade is the rapid growth of international co-operation in the solution of the health problems of the Hemisphere and the constant improvement in the co-ordination of the activities of the several official participating agencies ... The year 1958 finds the countries of the Americas committed to no less than four eradication programmes for the permanent elimination of smallpox, yaws, urban yellow fever, and malaria from the continent. A decade ago only one of these eradication programmes, that for the eradication of the *Aëdes aegypti* mosquito that transmits yellow fever, had been approved and the means were not then available for its execution. It is highly significant that the proposal for the eradication of yaws in Haiti, first made in 1949, has been followed by several yaws eradication programmes in other parts of the world. Most significant of all is the increasing dedication of the nations of the world to the programme for the eradication of the world's leading killer of a decade ago, malaria ...

" As the first decade of the World Health Organization ends, it is obvious that international collaboration in health has justified itself and has unlimited possibilities for the future. The countries of the Americas and of the world are learning better each year how to work together for the common good. It has long been recognized that disease knows no boundary; we are now learning that organization for health also can have no boundary."

*** Dr. FRED L. SOPER, Director, Pan American Sanitary Bureau (WHO Regional Office for the Americas)

" Among the international organizations with responsibility for building a better world, the World Health Organization ranks high. During its first ten years, it has achieved some startling successes. For example, in certain areas of the world, endemic yaws has been eradicated by one injection of penicillin for each person treated. Equally, the cycle of malaria infection has been broken in many places by spraying homes and other buildings with insecticides, such as DDT, and in several regions malaria has already been eradicated. Such successes are encouraging.

" In the long run, however, an even more important task is to build strong health services everywhere, served by sufficient health centres and medical teams to make the general public ' health conscious ' ...

" The realization of this aim is not easy. In every country the same problems present themselves in different ways. As one disease is eradicated, one problem solved, others grow in importance. A longer life brings with it special problems connected with old age.

" The lesson of the last ten years of health progress is nevertheless clear. Health for all is no longer an unattainable ideal, but an everyday reality well within man's grasp."

*** Dr AXEL HÖJER, former Director-General, Swedish Medical Board

" Today, social medicine is adopting new methods in the battle for health. One of the most important is early detection of disease while cure is still in some degree possible. During illness, attention is also paid to the material situation of the patient and his family, and when he has recovered, efforts are made to place him in employment which will not cause a relapse.

" The advent of social medicine has also transformed the role of the physician. Nowadays, the treatment of a patient means more than simply performing an operation or writing a prescription. The physician must see the man as he is, the whole man, must watch for the innumerable signs that reveal the influence of his environment. The patient brings with him into the consulting-room his family, his work, his surroundings—even his past and sometimes that of his forebears. He should be able to leave in possession of his own future and that of his children as revealed to him by the physician.

" These are all aspects of the new humanism in medicine, the ever-increasing attention paid to the man and not to the ' case ' ... "

*** Professor MARCIN KACPRZAK, Rector, Warsaw Medical Academy, Poland

" The stage that has been reached . . . in the conquest of infectious disease has not come about by luck but by hard work and effective organization. In the process, hundreds of research centres have been developed ; millions of health workers have been trained ; hospitals and health centres have been built both in cities and in remote areas ; people have formed voluntary organizations to combat sickness through joint action ; and governments throughout the world have created national and local health services that increasingly help all peoples to gain health.

" But the total needs are still very far from being met. Much more growth and extension are urgently needed in order that all may have the degree of protection that is available to an increasing but yet far too small segment of mankind. Moreover, the mass control of infectious disease does not solve all health problems nor end disease . . ."

*** Dr H. VAN ZILE HYDE, Chief, Division of International Health, Department of Health, Education, and Welfare, United States Public Health Service

" In 1946 . . . the World Health Organization, by virtue of its Constitution and other agreements, was given authority to formulate and adopt regulations to prevent the international spread of disease.

" It was a favourable time for the World Health Organization to enter the picture of international control of epidemic diseases, for by 1946 the causal micro-organisms of all the pestilential diseases were known, as were also their life histories and modes of transmission, including the agency of insect and animal vectors. In addition, the immunizing powers of the vaccinations against yellow fever, smallpox and cholera had been established, as had the value of certain insecticides and other sanitary measures in dealing with the insect carriers of plague, typhus, relapsing fever, and yellow fever.

" . . . What was required now was a practical and realistic approach to the problem of international health control, so as to limit quarantine measures to an effective minimum with the least possible interference with the speed of trade and travel, especially at transit points.

" The World Health Organization created an Expert Committee on International Epidemiology and Quarantine to review existing conventions and combine them into a single body of regulations covering the needs of all travellers, including sanitation at airports. As a result, the International Sanitary Regulations were adopted by the World Health Assembly in May 1951, and came into force on 1 October 1952. Certain amendments were made in 1955 and 1956. These regulations reduced quarantine procedures to a minimum compatible with existing sanitary conditions.

" In addition, a campaign was started to encourage health authorities of all countries to [improve] the hygiene and sanitation of airports and the areas around them so that they would neither be foci of infection nor be suitable for the introduction of disease, and [to immunize] their populations against certain of the pestilential diseases. This was a very important step in the international control of infectious diseases . . .

" Nowadays quarantine is rarely imposed. Infectious cases are isolated in hospital and contacts placed under surveillance—they have their liberty provided that they report to the health authorities any illness occurring within fourteen days.

" During the last decade, the pestilential diseases have been pretty well confined to a very few places where they are endemic, and even in those places there has been a marked decline.

" This satisfactory state of affairs is due to a number of factors : the development of highly efficient, organized medical and health services ; wider use of immunizations and the introduction of powerful insecticides and better techniques of application. Even more important perhaps has been the over-all improvement in hygiene and sanitation linked with health education of the public and better standards of living generally."

*** Sir HAROLD WHITTINGHAM, Chairman, Medical Committee, International Air Transport Association, and Chairman, Flying Personnel Research Committee, Air Ministry, London, United Kingdom

Reports of Expert Groups

ADDICTION-PRODUCING DRUGS

One of the tasks of the WHO Expert Committee on Addiction-Producing Drugs is to advise the Commission on Narcotic Drugs of the Economic and Social Council of the United Nations on the medical aspects of the control of narcotic drugs. The situation is periodically reviewed in the Committee's reports, which include technical information on drugs having addiction-producing properties.

In its eighth report[1] the Expert Committee reviews the addiction liability of a number of analgesic drugs from different groups of synthetic substances with morphine-like effect. It recommends that the present status of control be continued for dextromethadone, propoxyphene and the cough mixture " Ticarda " (containing normethadone), and that the recently developed analgesic dextromoramide (R 875), and three drugs of pethidine type—morpheridine, trimeperidine, and etoxeridine—be placed under the international control provisions applying to morphine.

In connexion with the introduction of new drugs, particularly those that are a potential hazard to public health owing to their inherent addiction liability, the report stresses the need for adequate information to be supplied to the medical profession. The Committee reiterated its view that heroin can be dispensed with as a therapeutic agent, emphasizing the availability of suitable substitutes.

Recent observations on nalorphine were considered by the Committee which found them of particular interest and importance. This drug counteracts various effects of the opiates and may prove helpful in the detection of opiate addiction. Yet it is comparable with morphine for the relief of pain. Unfortunately the general use of nalorphine as an analgesic is impracticable, since it is likely to produce disturbing side-effects, especially if the patient has been receiving other opiates. However, many compounds related to nalorphine are known or could be developed. One of these may prove to be the strong, non-addicting pain-reliever which the medical profession is seeking.

The report also refers to the group of drugs known as " tranquillizing " or " ataraxic " agents, and notes that cases of misuse of these drugs are being reported with increasing frequency. It reviews the possibility of developing a screening method for addiction-producing drugs by means of animal tests, and the progress made in this respect using monkeys as test objects. Other matters discussed in the report include the selection of proposed international non-proprietary names for narcotic drugs under international control, and the question of outmoded drugs at present included in lists of preparations exempted from international narcotics control.

[1] WHO Expert Committee on Addiction-Producing Drugs (1958) *Eighth report* (*Wld Hlth Org. techn. Rep. Ser.*, No. 142), 12 pages. Price: 1/9, $0.30, Sw. fr. 1.—. Also published in French and Spanish.

CLASSIFICATION OF ATHEROSCLEROTIC LESIONS

The common degenerative diseases are today among the most serious public health problems in many countries and offer a great challenge to medical research. Prominent among these diseases are those affecting the cardiovascular system, particularly atherosclerosis and ischaemic heart disease. A study group convened by WHO in 1955[1] emphasized the urgent need for pathological and clinical standardization and a standard terminology. As a first step in this direction, a

[1] *Wld Hlth Org. techn. Rep. Ser.*, 1957, 117

meeting of pathologists and other experts in this field was arranged by WHO in October 1957 to recommend methods of examining, assessing and reporting on necropsies, with particular reference to coronary artery and myocardial lesions. The report of this Study Group on the Classification of Atherosclerotic Lesions [2] sets forth standards for grading and classifying atherosclerotic lesions, and outlines an international programme of further study.

Definitions

Atherosclerosis, as defined in the report, is " a variable combination of changes of the intima of arteries (as distinguished from arterioles) consisting of the focal accumulation of lipids, complex carbohydrates, blood and blood products, fibrous tissue and calcium deposits, and associated with medial changes ".

Other definitions given, most of them of particular interest to the pathologist, are the following:

1. The term " fatty streak or spot " is applied to superficial yellow or yellowish-grey intimal lesions which are stained selectively by fat stains. It is not synonymous with " atheroma ".

2. The term " fibrous plaque " is applied to a circumscribed, elevated intimal thickening which is firm, and grey or pearly-white.

3. The term " atheroma " is applied to an atherosclerotic plaque in which fatty softening is predominant.

4. Complicated lesions are defined as lesions with additional changes or alterations such as haemorrhage, thrombosis, ulceration, and calcareous deposits.

Classification and grading of atherosclerotic lesions

The report states that classification of atherosclerotic lesions should be based on objective pathological findings rather than on specific schemes of pathogenesis, and that atherosclerosis should be considered to be the same process in different arteries. Grading of the lesions should always be made by gross examination with the naked eye; but other, supplemental procedures may also be very helpful—microscopic examination, chemical analysis, electron microscopy, histochemistry, radiological examination, and others.

In considering the difficulties involved in standardizing procedures so that the resulting observations may be compared with a reasonable degree of accuracy, the report calls attention to the need for relatively simple methods for the quantitation of lesions and stresses the desirability of using grossly visible changes. It also emphasizes the importance of basing any comparisons on the examination of material treated in the same way for all specimens within each age-group. Comparability in the classification of atherosclerotic lesions by different workers can best be achieved by developing and using standardized and objective methods of making and recording observations. Although complete objectivity can rarely be obtained, the subjective element might be somewhat reduced if, for example, an index of the extent of the lesion, such as an estimate of the percentage of total surface area involved, were used. There is some evidence that agreement may be acceptably close for lesions that involve either only a small or a very large percentage of the surface, and an index of extent of lesions might at least yield reasonably uniform observations on the proportion of very extensive or minimal lesions in different population groups.

Macroscopic grading

The report recommends specific procedures for the classification and registration of atherosclerosis in the coronary arteries, the cerebral arteries, and the aorta; and it states that it is desirable to note as well any changes in the pulmonary, the renal, and the mesenteric arteries. Specimen charts and diagrams for recording the data are shown in an annex to the report.

[2] WHO Study Group on the Classification of Atherosclerotic Lesions (1958) *Report (Wld Hlth Org. techn. Rep. Ser.*, No. 143), 20 pages. Price: 1/9, $0.30, Sw. fr. 1. Also published in French and Spanish.

Microscopic classification

The report concentrates on the histological grading of single atherosclerotic plaques, a procedure which may be valuable in characterizing special cases. Only two kinds of arteries are considered, those typified by the aorta and by the coronary arteries.

Histological changes found in the aorta include:

(1) fibrin-like film attached to the intimal surface or covered by endothelium;

(2) metachromatically staining material (complex carbohydrates) increasing the intimal thickness;

(3) lipid deposition, either extracellularly or intracellularly (foam cells), in the form of droplets of variable size;

(4) fibroplasia, largely confined to the subendothelial portion of the intima, in the form of mucopolysaccharides, increased amount of reticulin, collagen fibres, and hyalinization;

(5) calcification in fine or coarse granules;

(6) cholesterol crystals, finely granular amorphous glycoprotein material, and ulceration;

(7) vascularization, extravasated red corpuscles, haemosiderin and related by-products;

(8) medial changes such as lipid infiltration, disintegration of smooth muscle fibres, disruption of elastic fibres, cellular infiltration around vasa vasorum, and mucoprotein accumulation or alteration;

(9) secondary changes such as thrombosis with its consequences.

All these lesions can be found in the coronary arteries, but additional significance should be attached to the presence of narrowing of the lumen and to large intramural haemorrhages.

Special methods of grading

Further research should be undertaken to determine the objectivity and practicability of certain procedures—based on physical, chemical, or morphological characteristics—which might prove valuable in grading atherosclerotic lesions. Priority should be given to the development of methods for examining those arteries in which dysfunction is most liable to result from atherosclerosis, notably the coronary and the cerebral arteries.

The report suggests that the following techniques might be worthy of study and describes some of them briefly: measurement of the elasticity of the arteries; estimation of the consistency and viscosity of the elements of the arterial wall; radiography, including the injection of radio-opaque substances into the coronary artery system at various pressures, the use of image amplifier radiological techniques in the clinical demonstration of vascular lesions, and post-mortem radiological examination of the arteries; cool-dry methods, in which the aorta is opened, stripped of its adventitia and outer medial coats, stretched flat on a glass plate, and left for 36-48 hours in a refrigerator, with the result that the tissues become semi-transparent and reveal vascularization and haemorrhage of the intima and their relation to atherosclerotic plaques; use of electronic scanning and fluorescence to determine the extent of pathological constituents; morphogical methods, for which a combination of fixation at blood pressure levels and body temperature should be devised; simple chemical analysis; spectrographic methods for the estimation of trace elements; fluorescent immunochemical methods; and histochemical techniques.

The problem of statistics

The available statistics show marked geographical differences in mortality from cardiovascular disease in general and arteriosclerotic and degenerative heart disease in particular. However, some of these differences are undoubtedly related to lack of medical facilities, incompleteness of registration, and differences in the terminology used in classifying and certifying causes of death.

Pathologists should play an important role in certifying causes of death. In fact,

it may be said that the value of mortality statistics is proportional to the frequency with which the cause of death is confirmed by autopsy findings. Death certificates should always indicate whether or not an autopsy has been performed.

The Study Group suggested that, in the interests of improving statistics, comparative studies of death certificates of different countries should be made, with emphasis on promoting the use of the *International Classification of Diseases, Injuries and Causes of Death*.[3] Where outstanding differences are noted, the investigations may be extended by use of specific autopsy findings. The WHO Centre for the Classification of Diseases, in London, and the centre for Latin America, in Caracas, may be able to assist in these studies.

An international programme

The report outlines a programme for the pathological study of gross and histological lesions of atherosclerosis and for the development of associated epidemiological investigations. It suggests that WHO should promote and co-ordinate this work, and that the co-operation of international, non-governmental, scientific organizations would be helpful.

Among other proposals is one for the establishment of an international centre for the study of lesions of atherosclerosis. Such a centre would draw its material from many sources—regional and national centres, collaborating laboratories and institutions, etc.—and, after sufficient study, would prepare and distribute suitable guides for the classification and grading of lesions. Eventually, a network of centres might be developed, and individual and team pilot studies might be initiated and co-ordinated.

Comparative medicine may be of some value in the study of atherosclerosis; but the report warns that experimentally produced arterial lesions in animals present a complex of changes even more susceptible to misinterpretation than atherosclerotic lesions in man, and that their relationship to atherosclerosis in man has, in any case, not been clearly established.

[3] See *Chron. Wld Hlth Org.*, 1957, 11, 374.

THE CONTROL OF BRUCELLOSIS

The Joint FAO/WHO Expert Committee on Brucellosis met in October 1957 at Lima (Peru), immediately after the Fourth Inter-American Congress on Brucellosis. Some of the experts attending the Congress were invited to take part in two informal meetings of the Committee, which was thus able to obtain the latest information on brucellosis problems and research in the Americas.

At the outset, the Committee observed that since 1953, the date of its second report, considerable advances had been made in knowledge of the biology of the human and animal forms of brucellosis, as well as in their diagnosis and treatment, thanks in part to work done in the FAO/WHO Brucellosis Centres. Encouraging results have also been obtained in practice; estimated losses from bovine brucellosis in the USA, for example, were reduced from $100 million in 1947 to $40 million in 1957, and the success of the preventive measures taken in the Scandinavian countries, the Netherlands, the United Kingdom, the Union of South Africa, and the USSR, proves that control of this disease is now possible. These successes are all the more important in that, as a source of human illness and of livestock losses, brucellosis is still a major health and economic problem in certain parts of eastern Europe, Asia, and the Americas.

The purpose of the third report of the Committee [1] is not to provide yet another survey of the brucellosis problem as a whole, but solely to point out changes which have taken place in the last five years in ideas concerning brucellosis, and in its diagnosis

[1] Joint FAO/WHO Expert Committee on Brucellosis (1958) *Third report* (*Wld Hlth Org. techn. Rep. Ser.*, No. 148), 51 pages. Price: 3/6, $0.60, Sw. fr. 2. Also published in French and Spanish.

and treatment. It should therefore be regarded as a supplement bringing the two previous reports[2] up to date.

Brucellosis in man

The problem of the routes of transmission of the disease to man has, on the whole, been satisfactorily summarized in the Committee's earlier reports. However, there is now increasing evidence that cheese made from unpasteurized milk is an important source of infection; furthermore, numerous animal species—particularly the hare—which have been found to suffer from *Brucella* infections, represent a possible reservoir of infection which it would be dangerous to ignore. Both these aspects of the problem call for special investigation.

Recent experience has shed new light on the value and advisability of certain methods of treatment, particularly the use of antibiotics. Generally speaking, these substances shorten the duration of the disease, considerably reduce the number of fatal cases and are indicated in certain acute cases. However, as they may have unpleasant side-effects, which can persist for weeks or even months after treatment has ceased, and as, moreover, certain *Brucella* infections are of a mild nature, antibiotics should be used with discretion and only in carefully selected cases. Since penicillin has proved ineffective against brucellosis, use should be made of streptomycin or dihydrostreptomycin associated with sulfonamides, or of the tetracyclines alone. So far the latter seem to have given excellent results, and their use is recommended by the Committee. If the patient can tolerate the drugs, then treatment should be continued for at least three weeks according to the schedule of dosage given in the report. In the case of certain patients who are seriously ill, it has been found that administration of antibiotics can cause violent reactions, sometimes even a state of shock. An attempt has been made, with some degree of success, to prevent this reaction by the simultaneous administration of antibiotics and ACTH or corticosteroids; however, the greatest care should be taken in resorting to treatment with these hormones—termed " potent drugs " in the report.

In certain countries, considerable use has been made of attenuated strains of viable bacteria, and particularly *Br. abortus* strain 19, for the immunization of particularly exposed occupational groups. The method is said to have decreased the incidence of the disease; however, the Committee had not sufficient information in its possession to arrive at definite conclusions on the value of this method.

Brucellosis in animals

New knowledge concerning bovine brucellosis has led to a certain modification of the rules previously laid down for the interpretation of various diagnostic tests. As regards sero-agglutination tests, it is recommended that the minimum diagnostic titre be now increased to 200 IU of antibody per ml of serum for animals of 30 months or older which have been vaccinated with strain 19 in the first few months of life. The Committee also recommends the standardization of antigens used for the milk ring test against the international standard anti-*Brucella abortus* serum.

While the basic principles formulated in the first two reports are still valid, further experience in the field of bovine brucellosis has revealed certain new aspects of the problem. In the first place, the collaboration of livestock owners is essential to the success of any measures contemplated—if owners are made conscious of their real interests and their support is obtained, this will enormously facilitate the work of health teams. The organization of dynamic and effective information campaigns must henceforward be considered as a necessary adjunct to any well-planned preventive action. Moreover, it is well to remember that the aim of brucellosis control is the total eradication of the disease and not merely its regression. Programmes should always be drawn up and methods selected with this consideration in mind.

As concerns vaccines, the superiority of *Br. abortus* strain 19 and its effectiveness for

[2] *Wld Hlth Org. techn. Rep. Ser.*, 1951, 37; 1953, 67

the immunization of young cattle are now well established. Trials made in two countries show that a single dose of strain 19 inoculated between the sixth and eighth months of life immunizes cattle for seven years and makes revaccination practically unnecessary. Experiments carried out with reduced doses administered by different routes seem also to have produced satisfactory immunity. So far, the data on this point are insufficient for exact determination of the optimal dose for every route of administration; however, the optimal subcutaneous dose should never be less than 50×10^9 viable bacteria. When administered in good time, strain 19 vaccine is an excellent means of prevention; on the other hand, administration to adult cattle should be avoided as far as possible, in order to prevent confusion between sero-agglutination titres due to the vaccines and those due to natural infection in subsequent tests.

Research on caprine brucellosis, carried out in accordance with recommendations made in the previous reports, has shown that this form of the disease also causes serious economic losses, but is important chiefly because it is frequently transmitted to man. Prophylactic action in this field is hampered by the fact that the process of transmission of the disease between animals in the same herd is not entirely clear, and because, moreover, the organism responsible, *Brucella melitensis*, is difficult to detect by the usual diagnostic tests. This uncertainty makes it necessary to consider as suspect all animals in a herd where a single case of infection has been confirmed, and to isolate or even to slaughter them. The results obtained by this drastic method in France, Yugoslavia and Chile prove that, in the long run, it is the only way of ensuring total eradication.

The inadequate immunity against *Br. melitensis* conferred by the available vaccines, and particularly strain 19, has made the control of caprine brucellosis still more difficult. However, since the publication of the Committee's second report a series of new vaccines giving satisfactory protection has been developed; two vaccines consisting of killed *Br. melitensis*, and a living attenuated vaccine seem to offer special advantages. The Committee recommended that controlled experiments on several thousand animals be undertaken with these vaccines without delay.

Ovine brucellosis, which has proved to be more widespread than was suspected, may be caused by any of the three *Brucella* species. Nevertheless, in regions where it is frequent its pathogeny resembles that of caprine brucellosis and the causal organism is usually *Br. melitensis*. Almost the same difficulties are encountered in the interpretation of diagnostic tests as in the case of caprine brucellosis; on the other hand, prophylaxis seems to be easier, since not only vaccines consisting of killed *Br. melitensis* but also strain 19 vaccines are said to have been effective. However, this question needs to be more thoroughly investigated.

Finally, there are many reports indicating that the incidence of porcine brucellosis is steadily increasing and that this zoonosis is now a major problem in certain countries. Consequently, research on diagnostic tests suitable for this type of infection must be vigorously pursued.

Laboratory and research work

Part of the report is devoted to the interpretation and standardization of certain diagnostic tests and to methods for the isolation and identification of different *Brucella* species. The Committee paid special attention to the standardization of sero-agglutination tests; basing itself on the recommendation made by the WHO Expert Committee on Biological Standardization in its seventh report,[3] the Committee recommended in turn that, in stating the results of this test, mention be made of the number of IU ml corresponding to the titre obtained, since this notation has the advantage of facilitating comparison of data given by different methods. The Committee also noted the considerable progress made in the development of selective culture media. Finally, it expressed the opinion that the new names given certain *Brucella* strains which, because of their ambiguous nature, cannot be classified in one of the three recognized categories, were premature and

[3] *Wld Hlth Org. techn. Rep. Ser.*, 1954, **86**

that the matter should be referred to the International Committee on Bacteriological Nomenclature.

In conclusion, the Committee again stressed the importance of the work done by the FAO/WHO Brucellosis Centres, now numbering fifteen, as well as by other specialized laboratories which have been kind enough to co-operate. These institutions have greatly assisted eradication campaigns in various countries, and their effectiveness is best shown by the fact that their activities have now diminished in certain regions, where the brucellosis problem has practically disappeared.

Notes and News

Eye complications in protein malnutrition

The syndrome characterized chiefly by a dietary deficiency of protein and known by a variety of names—kwashiorkor, fatty liver disease, nutritional oedema and nutritional dystrophy, to mention but a few—is prevalent among young children in most of the malnourished countries of the world. The clinical picture, however, is by no means the same in every detail in the various places where the syndrome is encountered. This is particularly true of the occurrence of eye lesions—an important complication, often leading to loss of sight, that has not in the past always received sufficient attention from clinicians. While the reports of some investigators specifically mention the presence or absence of eye signs, those of others fail to comment on the state of the eyes.

An article on the involvement of the eyes in protein malnutrition will shortly appear in the *Bulletin of the World Health Organization*. The author—Dr D. S. McLaren of the East African Institute for Medical Research, Mwanza, Tanganyika—has made an extensive review of the literature, including the early as well as the more recent descriptions of the syndrome, and cites many instances of the association of eye changes with protein deficiency. It seems clear from this review, which covers all parts of the world, that the eye complications are due to an accompanying vitamin deficiency (of vitamin A in the case of the blinding conditions such as xerophthalmia and of the B-complex vitamins in the case of certain of the less serious conditions) rather than to the lack of protein itself, as has been suggested by some workers.

A striking report quoted by Dr McLaren—and one which lends very strong support to the vitamin-deficiency theory—comes from Mexico City, where 450 out of 500 sufferers from protein malnutrition were found to present the diminished humidity of the conjunctiva that is characteristic of vitamin-A deficiency. Further investigation of these 450 cases revealed that 78% had early xerosis, 7% had xerophthalmia, 12% had keratitis and 1.3% showed Bitot's spots, and that blood titres of vitamin A and carotene as low as 10-20 units per 100 grams were common.

Theoretically, there are several ways in which lack of protein may adversely affect the metabolism of vitamin A. For example, it may interfere with the absorption, storage or transport of the vitamin in the body or with the conversion of the provitamin, carotene, to the vitamin proper. Or again it may be that a disordered protein metabolism in some way inhibits the function of vitamin A in cellular metabolism—a function about which very little is known, except with regard to the retina. But the practical significance of these factors has yet to be discovered and, in Dr MacLaren's opinion, a low dietary intake of vitamin A is likely to be the prime cause of the eye complications, and making good the deficiency the best means of preventing them. To quote the concluding words of his article: "With

regard to therapeutic and prophylactic measures, it seems probable from the work which has been done that, even in the absence of gross physical signs, the vitamin-A stores are low in the protein-malnourished child. Consequently, correction of this should be part of any programme of treatment."

Onchocerciasis control in the Sudan

The first internationally assisted programme for the control of onchocerciasis in Africa is shortly to be implemented in the Sudan. This disease is particularly widespread in the two southern provinces of the Sudan, Equatoria and Bak-el-Ghazal, where it bears the ominous name of " river blindness " owing to the immense number of cases of blindness and other serious ocular lesions for which it is responsible.

The problem has economic and social, as well as public health, aspects. The area in question is rich and full of economic promise on account of its abundant water-courses, but it is precisely along these water-courses, which provide breeding places for *Simulium*, the vector of onchocerciasis, that the endemic foci of the disease are installed.

Although research workers of many nationalities, including Sudanese, have made very interesting studies of the local epidemiology of onchocerciasis, no real attack on the disease had formerly been made, owing to the lack of the necessary practical facilities. However, now that techniques for the control of both parasites and vectors are available (as indicated in the report of the WHO Expert Committee on Onchocerciasis) the Sudanese Government has decided to undertake a campaign, in collaboration with WHO, for the abolition of this scourge which ravages two of the country's most fertile provinces.

After a study tour of the endemic zones in 1956 by Professor Giaquinto of WHO, a specialist in onchocerciasis, the Sudanese Government and WHO (the latter through its Eastern Mediterranean Regional Office) drew up a plan of operations.

The general plan includes measures for the control of parasites and their vectors in a demonstration area, and a preparatory epidemiological survey for the purpose of defining the most seriously affected areas. Control operations proper will begin in these areas, and Sudanese personnel will be trained in the techniques used for the detection of the disease and its ocular complications, and in treatment and control methods.

The epidemiological survey will be directed by Dr R. d'Haussy, who went to the Sudan in March, on behalf of WHO, to assist the Sudanese Government in developing the programme. Dr d'Haussy was formerly Director of the Institute of Tropical Ophthalmology at Bamako in French West Africa, and Professor of Tropical Ophthalmology at the Centre d'Instruction et de Recherches de l'Ecole d'Application, Marseilles. He has had wide experience of the difficult problems of ocular onchocerciasis, which he has studied in all its aspects (epidemiological, clinical, therapeutic and histopathological).

Japanese studies on insecticide resistance

A considerable amount of research on the problem of insecticide resistance has been carried out by Japanese scientists, but, owing to language difficulties, much of it has not been easily accessible to scientists in other parts of the world.

In 1957, Dr A. W. A. Brown of the Division of Environmental Sanitation, WHO Headquarters, therefore visited Japan, where, in co-operation with Dr S. Takei and Dr S. Nagasawa, he assembled a collection of 36 papers by Japanese scientists, either dealing directly with insecticide resistance or shedding light on the problem by examining the physiological effects of insecticides on various insects. This collection was translated into English and has now been published by the Institute of Insect Control, Kyoto University, under the title *Japanese Contributions to the Study of the Insecticide Resistance Problem.* A limited number of copies are available for distribution and may be obtained direct from the WHO Regional Office for the Western Pacific, P.O. Box 2932, Manila, Philippines.

Malaria eradication in Jamaica and Mexico

Over 1 300 000 people in Jamaica—or 87% of the population—are exposed or subject to malaria, and the disease is prevalent in an area covering nine-tenths of the island.

Jamaica's health authorities are now taking action, not merely to control malaria, but to eradicate it. WHO and UNICEF are collaborating in this task.

Under the eradication plan prepared and approved in 1956, the Jamaican Government will spend some $1 548 000 on a four-year spraying campaign, covering the entire malarious area. UNICEF's contribution amounts to $529 000, while the Pan American Sanitary Bureau (which acts as the WHO Regional Office for the Americas) is providing three international malaria experts, antimalaria drugs, vehicles, and other imported equipment and supplies not furnished by UNICEF. The Bureau is also providing training, through fellowships, for the personnel employed in the eradication campaign.

Jamaica is divided into 13 parishes, each supervised by a medical officer. Before spraying, geographical and epidemiological reconnaissance was carried out in each parish; this mapping operation was completed in December 1957. Conferences and seminars have been held for public health inspectors, supervisors, and evaluators, so that they may be able to secure the fullest co-operation from the public when the campaign is in progress.

Residual spraying operations began in January 1958. The supplies from UNICEF have been divided up among the parishes, and there is also a central warehouse in Kingston. Houses in the malarious area of the island will be sprayed with dieldrin over a period of four years, after which surveillance measures will be established.

* * *

Until recently, Mexico had the biggest single malaria problem in the Americas, containing almost 65% of the population of the Region still unprotected against the disease. Some 17 000 000 Mexicans live in the country's malarious areas, where there were 2 000 000 malaria cases in 1954 alone, and where the disease used to cause an estimated 20 000 deaths each year.

The campaign for the eradication of malaria in Mexico was officially initiated in December 1955, when an agreement was signed between the Mexican Government, the Pan American Sanitary Bureau, and UNICEF. At the same time, a presidential decree established the National Commission for the Eradication of Malaria, an autonomous organization for the planning and execution of the campaign. Even before these steps were taken, national and international personnel had made careful studies of all existing information about malaria in the country, its prevalence, and the numbers of people to be protected and houses to be sprayed. Estimates had been made of the necessary materials and their cost, and the general organizational structure of the eradication programme had been planned.

Work during 1956 was concentrated on the training of personnel, the geographical delimitation and reconnaissance of malarious areas, arrangements for the movement of supplies and equipment, and steps to secure the co-operation of the public in the preparation of houses for spraying. Maps were made of over 40 000 localities, and almost 3 000 000 houses were located and numbered. Data were also gathered on house construction materials, roads and transport problems. More than 1 500 000 lb. of DDT, supplied by UNICEF, were moved by ship to dry storage, and thence to supply points for zones, sectors and field brigades.

Preliminary spraying began in September 1956; over 800 persons took part in this task, many of them travelling by horse, by boat, or on foot into almost inaccessible areas. Full-scale spraying began in January 1957, and will continue for four years.

Some idea of the extent of the campaign may be gained from the following figures. The Mexican authorities allocated nearly $2 500 000 to the country's National Malaria Service in 1956. For the eradication campaign, the Service employs a professional and technical staff of almost 400 persons, includ-

ing 155 doctors. The number of field personnel employed exceeds 3000, and some 500 spraying squads are at work: the plan of operations for 1957 alone involved the spraying of 2.1 million houses twice during the year. Nearly 700 vehicles are being used in the campaign, including 200 jeeps and 415 pick-up trucks. Some 1700 beasts of burden are used for transport purposes in areas where roads are unsuitable for vehicles. It is estimated that the campaign will cost approximately $25 000 000.

* * *

To date, malaria eradication campaigns in the Americas have provided protection for more than 105 million people, and they are expected to reach another 30 million people within the next few years. The aim is to achieve malaria eradication in the shortest possible time and before mosquitos can become resistant to residual insecticides. Campaigns could then be discontinued and the cost of malaria control would cease to be a burden on national health budgets. Moreover, if eradication programmes are put into operation on a continuous basis over the next ten years, it should be possible to prevent the recurrence of large-scale epidemics.

Training of staff for malaria eradication

The need for suitably trained staff to give technical assistance to countries undertaking malaria eradication programmes has led to the organization of a WHO training scheme for malariologists. At the end of November 1957, the first batch of trainees—thirteen medical officers, most of whom had previous experience of tropical medicine—started a four-week theoretical and laboratory course at the Ross Institute, London School of Hygiene and Tropical Medicine. This course was arranged with the co-operation of Professor George Macdonald. It was followed by two weeks of technical and administrative briefing in Geneva, after which the group left for four months' training in Turkey and Iraq under the guidance of Professor A. Coradetti, Dr M. E. Farinaud and Dr A. Gilroy. On completion of this field training, the participants will return to Geneva and take an examination; the successful candidates will then be assigned to various malaria eradication projects.

A similar training scheme for entomologists was started by WHO, at the beginning of March, with a theoretical and laboratory course at the Institute of Tropical Hygiene and Geographical Pathology in Amsterdam. This will be followed by field training in Iran and East Africa. In addition, arrangements are being made for the training of sanitarians and laboratory technicians.

The Pan American Sanitary Bureau (WHO Regional Office for the Americas) has also arranged training courses (in Spanish and English) for various categories of antimalaria personnel. The first English course was held in Guatemala at the end of 1957. A regular training centre with instruction in English has now been set up at Kingston, Jamaica, and several courses will be held there during 1958.

Control of venereal diseases

A WHO seminar on the control of venereal diseases was held in Tokyo from 17 to 29 March. The participants came from the following countries and territories in the Western Pacific Region: Australia, Cambodia, French Settlements in Oceania, Hong Kong, Japan, Korea, Laos, Singapore, Taiwan (China), Philippines and Viet-Nam.

The purpose of the seminar was to review problems of venereal disease control in the countries of the Region and to seek effective ways of dealing with them. Particular attention was paid to the question of adapting the latest principles and methods of control to local circumstances. Among the topics discussed were: the diagnosis, therapy and epidemiology of the venereal diseases; recommended methods for use in clinical practice and in mass campaigns; evaluation of the venereal disease problem and of control methods; the control of venereal diseases at ports, and the role of certain population groups in the spread of these diseases.

Diarrhoeas in children

The number of studies on diarrhoeas in children now being undertaken in various parts of the world leaves no doubt as to the widespread concern about this health problem. For example, a national study on diarrhoea-enteritis in infants is in progress in the Philippines, and in Iran the staff of the Maternal and Child Health Demonstration and Training Centre, Teheran, are discussing with the Public Health Laboratory the possibility of an investigation into the etiology of gastro-enteritis. In addition, the WHO Regional Office for the Americas has held seminars on the subject in Santiago (Chile) and Mexico.

Studies in this field are also carried out at WHO Headquarters and a WHO Study Group will meet to discuss the problem of diarrhoeas, including diarrhoeas in children, in the course of this year.

Health education in schools

A study guide on the training of teachers for health education has been issued jointly by WHO and UNESCO. This 16-page mimeographed booklet is intended to stimulate discussion and encourage practical measures for the improvement of health teaching in schools.

The guide is being distributed by WHO to Ministries of Health, through its Regional Offices, and by UNESCO to Ministries of Education. In addition, the International Union for Health Education of the Public is sending copies to non-governmental organizations and national associations concerned with health education.

New WHO building in Manila

At the end of January, Dr Paulino J. Garcia, Secretary of Health for the Philippines, presented a cheque for 100 000 pesos ($50 000) to the WHO Regional Office for the Western Pacific. This cheque represented the first instalment of a sum of $250 000 which the Government of the Philippines has agreed to donate towards the construction of a new WHO Regional Headquarters building in Manila. The Philippines Government has also donated the site for the building, on which work will shortly start.

People and Places

Malaria advisory teams

A WHO malaria advisory team, under the leadership of Dr P. C. Issaris, left for Mauritius in February for a period of four months. The team entomologist, Dr J. N. Hadjinicolaou, comes to WHO from the Athens School of Hygiene, where he has been Chief Entomologist since 1938. The laboratory technicians on the team are Miss A.-M. Ulrich and Mr K. Thymakis.

Another WHO malaria advisory team, which recently completed an assignment in Burma, will be working in North Borneo and Cambodia during the next few months. Dr S. Avery-Jones, leader of the team, accompanied by Miss Luela Lowy and Mr P. F. Beales, the laboratory technicians, went to North Borneo in February to assist in general survey work and in the training of local technicians. Dr W. G. G. Buttiker, the team entomologist, has left for Cambodia where he will be joined after six weeks by the remainder of the team.

The principal task of WHO's malaria advisory teams is to assist governments in the evaluation of antimalaria programmes, and to advise on future developments. Before presenting their recommendations, the teams carry out field surveys and discuss their findings with a consultant malariologist appointed by WHO. In the case of the team sent to Mauritius, the consultant will be Dr A. Gilroy, while Dr M. E. Farinaud will act as consultant for the team in Cambodia.

Bilharziasis control in Iraq

Dr Haig Najarian has been appointed scientist on the WHO-assisted bilharziasis control project in Iraq. His task will be to study snail ecology. Dr Najarian holds a postgraduate degree in zoology from the University of Michigan and, before joining WHO, was an associate research parasitologist at Messrs Parke Davis & Co., Detroit. He has specialized in helminthiasis research with particular reference to the biology of trematodes.

Rural health team for Nigeria

WHO has sent a team to Nigeria to help the Government in developing a rural public health service. This service will provide training facilities for personnel taking part in Eastern Nigeria's expanding rural health programme. The team is composed of a public health administrator, a health inspection tutor, a health visitor and a maternal and child health officer.

The public health administrator (and team leader) is Dr A. Spitz, who until recently was medical officer on a WHO public health and sanitation project in the Seychelles. Mr Paren Ganimian, the health inspection tutor, will join the team in May 1958. He is a graduate of the University of Beirut, and is at present employed as regional sanitarian with the Libyan-American Joint Public Health Service.

Environmental sanitation in refugee camps

Mr D. Konchady, of India, has been appointed by WHO to succeed Mr C. Morse as Sanitation and Camp Maintenance Officer attached to the United Nations Relief and Works Agency (UNRWA), Beirut. He will be responsible for the planning and technical supervision of environmental sanitation in the Agency's refugee camps. A graduate of Harvard and Johns Hopkins Universities, Mr Konchady is at present Professor of Public Health Engineering at Guindy College, Madras.

Tuberculosis control in Viet Nam

A WHO medical officer—Dr Fazil Erhat—has gone to Saigon to assist the Government of Viet Nam in its tuberculosis control work. A graduate of the University of Istanbul, Dr Erhat was Deputy Director of the Tuberculosis Control Centre in Turkey until recently. In 1953, he was awarded a WHO fellowship to study tuberculosis control in European countries.

Fellowships for mental health workers

Four staff-members of the National Mental Hospital in Mandaluyong, Philippines, have been awarded WHO fellowships for four months' study of mental health work at a hospital in Melbourne, Australia. They are: Dr Carlos C. Vicente and Dr Leónida Dolorfino-Mariano, senior resident psychiatrists, and Miss Teófila R. Axibal and Mr Crispín N. Vibar, psychiatric nurses. The group left for Australia early in February.

These fellowships have been awarded as part of a programme of assistance to the Philippines National Mental Hospital by the WHO Regional Office for the Western Pacific. In addition, Dr Manuel M. Escudero has been assigned by WHO to help the Philippines Department of Health in developing its mental health activities, including the training of personnel.

Regional appointments

Dr Francisco J. Dy has been appointed Director of Health Services in the WHO Regional Office for the Western Pacific. Prior to this appointment, Dr Dy was WHO Malaria Adviser for the Western Pacific Region.

Dr Gabriele Gramiccia has been appointed WHO Regional Malaria Adviser for Europe.

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